Predictive Analysis: An Unnecessary Risk In the Contemporary Operating Environment

A Monograph
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14. ABSTRACT

The construct for predictive analysis is based on the unfounded assumption that technologies and sound analysis will dissipate uncertainty in war. U.S. military doctrine shows an expectation for prediction from the intelligence process; it assumes that prediction is possible, and details a methodology to achieve predictive results. However, this methodology is based on assumptions that presuppose an adversary with a developed doctrine or well-developed patterns of operation. Given that predictive analysis is based largely on knowledge of cyclical patterns in the form of doctrine or established procedures, current U.S. military analytical methods are at odds with the existing geo-political environment. Predictive analysis may still have its place - against a well-known, conventional peer competitor, or against a more unconventional foe who falls into recognizable patterns over time. Still, research suggests that predictive analysis is not feasible for operations in the COE due to the environment's discontinuous nature, inherent unpredictability, and the resultant level of risk to the friendly force as adversaries make the attainment of surprise a priority. In order to establish a baseline understanding of the various theories as to the relationship between intelligence and maneuver, the monograph examines the three primary modern schools of thought on intelligence methods and their uses of prediction. With this theoretical understanding of the range of possible relationships between intelligence, prediction, and maneuver, the monograph explores the nature of the contemporary operating environment, and aspects of unpredictability within the environment. The monograph then returns to the concept of prediction, using the earlier theoretical basis and understanding of the contemporary operating environment to examine how uncertainty in general, and human behavior in particular, makes successful prediction in war unlikely, and increases risk for the friendly command. With that understanding of the dangers of prediction, the monograph examines the expectations for prediction in U.S. military doctrine, showing how the doctrinal requirements for prediction are subject to high levels of uncertainty. The monograph concludes with the judgment that predictive analysis is not feasible in the COE due to the inherent risk of deception and surprise associated with prediction. The monograph includes proposed changes to the JIPB process and the planning methodology that transform intelligence from a driver of maneuver to a protector of it.

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ABSTRACT

PREDICTIVE ANALYSIS: AN UNNECESSARY RISK IN THE CONTEMPORARY OPERATING ENVIRONMENT by Major Dennis Lewis, United States Army, 48 pages.

The construct for predictive analysis is based on the unfounded assumption that technologies and sound analysis will dissipate uncertainty in war. U.S. military doctrine shows an expectation for prediction from the intelligence process; it assumes that prediction is possible, and details a methodology to achieve predictive results. However, this methodology is based on assumptions that presuppose an adversary with a developed doctrine or well-developed patterns of operation. Given that predictive analysis is based largely on knowledge of cyclical patterns in the form of doctrine or established procedures, current U.S. military analytical methods are at odds with the existing geo-political environment. Predictive analysis may still have its place – against a well-known, conventional peer competitor, or against a more unconventional foe who falls into recognizable patterns over time. Still, research suggests that predictive analysis is not feasible for operations in the COE due to the environment's discontinuous nature, inherent unpredictability, and the resultant level of risk to the friendly force as adversaries make the attainment of surprise a priority.

The U.S. military is in need of an alternative method of intelligence – one that does not rely on prediction (and its subsequent reactive approach and risk of surprise) but rather one that works within the realm of uncertainty and seeks to disable the enemy as an effective fighting organization, retaining initiative with the friendly force. Doctrine should give commanders and analysts the freedom to focus on enemy capabilities rather than intentions by removing the doctrinal requirement for prediction of enemy courses of action in probable order of adoption and developing a new intelligence methodology. A modified form of the descriptive method of analysis would be such a method, resolving the dichotomy between the unpredictable nature of the environment and the requirement for predictive results from intelligence.

In order to establish a baseline understanding of the various theories as to the relationship between intelligence and maneuver, the monograph examines the three primary modern schools of thought on intelligence methods and their uses of prediction. With this theoretical understanding of the range of possible relationships between intelligence, prediction, and maneuver, the monograph explores the nature of the contemporary operating environment, and aspects of unpredictability within the environment. The monograph then returns to the concept of prediction, using the earlier theoretical basis and understanding of the contemporary operating environment to examine how uncertainty in general, and human behavior in particular, makes successful prediction in war unlikely, and increases risk for the friendly command. With that understanding of the dangers of prediction, the monograph examines the expectations for prediction in U.S. military doctrine, showing how the doctrinal requirements for prediction are subject to high levels of uncertainty. The monograph concludes with the judgment that predictive analysis is not feasible in the COE due to the inherent risk of deception and surprise associated with prediction. The monograph includes proposed changes to the JIPB process and the planning methodology that transform intelligence from a driver of maneuver to a protector of it.

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Introduction

The importance of intelligence in war is without question. Public and professional outcries over specific "intelligence failures" indicate that U.S. citizens value intelligence and expect it to work. What is in question is the proper function of intelligence. An examination of the works of military theorists, as well as the U.S. Army's own doctrinal records, clearly shows a tension between the ideas of intelligence as a reliable predictor of future events, and intelligence as a means of understanding the current situation. The modern U.S. Army, as well as the remainder of the U.S. military, has clearly adopted the predictive approach, professing intelligence to be a predictor of the future state of the battlefield.

In fact, it is now a generally accepted maxim within the U.S. Army that "intelligence drives maneuver," meaning that intelligence provides the information (including information on the enemy's future state) upon which military operations are planned. The acceptability of this maxim to the Army community is evident in its doctrinal language, which states, for example, that intelligence provides the basis for friendly course of action development and analysis.[1] This embracing of intelligence is unobjectionable by itself; it would by foolhardy to argue that any military operation does not need information about the enemy that has been collected and interpreted with respect to the specific mission. Unfortunately, the current U.S. military methodology for intelligence production, Intelligence Preparation of the Battlefield (IPB), propagates the idea that the intelligence process can routinely predict an enemy's chosen course of action. This has come to be known as "predictive intelligence"—a term not defined in U.S. military doctrine, but used to encompass the various doctrinal requirements to determine future

[1] U.S. Department of the Army, FM 5-0, *Army Planning and Orders Production* (Final Draft) (Washington, D.C.: U.S. Government Printing Office, 2002), 3-14.

enemy actions.[2] This method requires the analyst to determine the threat's possible courses of action and arrange them in order of probability of adoption.[3] When the premise of predictive intelligence is combined with IPB's assertion that its doctrinal principles can be applied to *all* situations,[4] the result is a military planning process that relies on a prediction of enemy action as a precondition for the development of friendly plans. Intelligence, as predictor of enemy activity, *is* driving maneuver.

However, it is becoming increasingly apparent that predictions of enemy activity should not drive maneuver, particularly with the types of adversaries present in the current geo-political environment. Predictive intelligence is not feasible in the contemporary operating environment (COE). The primary factor contributing to this unfeasibility is predictive analysis' reliance on patterns of past enemy activity as the guide for predictions of future events. This factor exists both in the U.S. Army's analytical method, IPB, as well as in the analytical method used by joint forces – JIPB, or joint intelligence preparation of the battlespace. As this monograph will show, adversaries in the COE consciously avoid patterns, or intentionally manipulate operational patterns as the basis for establishing the conditions necessary to achieve surprise. The current Army and joint military planning processes, by forcing the intelligence analyst to state enemy courses of action in order of probable adoption, allow the analyst to accept risk for the friendly

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[2] The U.S. Army's capstone intelligence manual, FM 34-1, *Intelligence and Electronic Warfare Operations*, lists "predictive" as one of the four characteristics of effective intelligence (the others are "timely," "relevant," and "accurate.") The manual goes on to explain that intelligence should tell the commander what the enemy is doing, what he can do, and his most likely course of action. These requirements suggest that the attainment of certainty is possible, emphasizing prediction while minimizing the potential for deception and surprise.

[3] U.S. Department of the Army, FM 34-130, *Intelligence Preparation of the Battlefield* (Washington, D.C.: U.S. Government Printing Office, 1994), 1-5.

[4] Ibid., 1-4.

unit -- a decision normally reserved for the commander, not a staff officer.[5] This monograph will show that even if adversary patterns of activity could be determined, there is no mechanism by which observed events could be extrapolated into accurate projections of future events. This inability to reliably predict future events is due to uncertainties associated with human behavior, technology, and the relationship between cause and effect. The lack of established operational patterns, combined with the inherent uncertainties of the contemporary operational environment, indicate that accurate prediction of enemy courses of action is unlikely in the COE, and that the very process of prediction makes the friendly command vulnerable to unexpected enemy actions.

Fortunately, there is an alternative to predictive analysis. This monograph will describe how a descriptive method of intelligence analysis focuses on facts related to the current situation. A descriptive method rejects prediction, but describes the current situation based on confirmed information and the relationship of that information to enemy capabilities (i.e., capabilities that can be confirmed, are suspected, or can be denied). The commander may prioritize enemy capabilities, but he does so based on that enemy capability posing the greatest risk to his own plan. He does not base his plan on expected enemy actions, but rather generates his own course of action to accomplish his mission, taking steps to mitigate the enemy capability that presents the greatest risk. Under a descriptive method, intelligence does not drive maneuver, but rather protects it, by making these risks known to the commander.

In order to establish a baseline understanding of the various theories as to the relationship between intelligence and maneuver, this monograph will examine the three primary modern schools of thought on intelligence methods and their uses of prediction. With this theoretical understanding of the range of possible relationships between intelligence, prediction, and

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[5] U.S. Department of the Army, FM 100-14, *Risk Management* (Washington, D.C.: U.S.

maneuver, the monograph explores the nature of the contemporary operating environment, and aspects of unpredictability within the environment. The monograph will then return to the concept of prediction, using the earlier theoretical basis and understanding of the contemporary operating environment to examine how uncertainty in general, and human behavior in particular, makes successful prediction in war unlikely, and actually increases risk for the friendly command. With that understanding of the dangers of prediction, the monograph continues on to examine the expectations for prediction in U.S. military doctrine, showing how the doctrinal requirements for prediction are subject to high levels of uncertainty. The monograph concludes with the judgment that predictive analysis is not feasible in the COE due to the inherent risk of deception and surprise associated with prediction. The monograph includes proposed changes to the JIPB process and the planning methodology that transform intelligence from a driver of maneuver to a protector of it. Important sub-questions to be answered include: What is the basis for predictive analysis? What types of events can be predicted? What is the doctrinal expectation for predictive results from intelligence? What aspects of the COE tend toward unpredictability?

Section One: Modern Intelligence Systems[6]

The basic tension between the value of intelligence as a reliable aspect of planning for future events and the inability of intelligence to reliably forecast the future is a contemporary issue. Modern theories on intelligence prediction reflect the broader, ongoing debate as to the ability of the social sciences to predict behavior. The conflict is evident in the three basic intelligence methods that emerged during and after World War II -- the intentions system, the

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Government Printing Office, 1998), 3-2.

[6] This section draws on Richard J. Quirk III's "Seeking A Theory of Tactical Intelligence to Support the Airland Battle" (Monograph, School of Advanced Military Studies, Fort Leavenworth, Kansas, 1985). Quirk's monograph serves as a good basis for comparison of the three combat intelligence systems

capabilities system, and the descriptive system. An examination of each system reveals the varying degrees of reliance placed on predictive intelligence, and how the U.S. army rejected the predictive approach during World War II only to readopt it during the Cold War.

Intentions System

During World War II, both the British and German armies believed that they could defeat enemy forces through prediction of their next action.[7] When the United States entered the war, it found itself dependent on British intelligence for strategic and tactical information.[8] The alliance with the British brought great quantities of detailed intelligence to U.S. forces, and encouraged the U.S. to adopt the British tactical intelligence system, called the intentions system, for their own use.[9] The intentions system, like today's U.S. military doctrine, established the role of intelligence as that of predicting future enemy actions, which intelligence analysts made based on assumed enemy intentions and the application of sound military logic, psychology, and enemy doctrine. Within a short time, however, the U.S. Army became disillusioned with the intentions system and discontinued its practice because of the danger of underestimating the enemy.[10]

Capabilities System

The U.S. Army did not completely discard the idea of predictive intelligence. It theorized that future enemy actions might still be predictable if intelligence analysts relied on facts, rather than on speculation as to the enemy's intent. To apply this theory, the U.S. Army

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that emerged during and after World War II. This monograph follows Quirk's basic structure for relating the three systems to each other and to the events of the time.

[7] Elias C. Townsend, *Risks: The Key to Combat Intelligence* (Harrisburg, Pennsylvania: The Telegraph Press, 1955), 48–69.

[8] "Report of the Committee Appointed by the Secretary of War to Study War Department Intelligence Activities" (Washington, D.C.: 1945), App. B, Ann. B, p.6.

[9] James Howell, "The Development of Combat Intelligence," *Military Review* (May 1943): 39.

readopted its own doctrine of 1940, known as the capabilities system of intelligence.[11] Under this system, the intelligence officer was still expected to eliminate uncertainty about the enemy. However, the capabilities system was more conservative than the intentions system, and focused on the enemy's physical capabilities. The intelligence analyst determined possible enemy courses of action based on the actual enemy situation, rather than upon the enemy's presumed intent or doctrine. This process permitted the intelligence officer to rank order possible enemy capabilities in a statement of "relative probability of adoption,"[12] but limited such a prioritization to those occasions when the analyst had sound justification to do so. It specifically prohibited the analyst from drawing conclusions as to enemy intent based only on speculation, either from the analyst placing himself in the position of the enemy, or from the analyst conducting terrain analysis.[13]

Intelligence analysts and commanders saw this method as a favorable compromise between the two extremes of simple historical reporting and dangerous unfounded speculation. Reflecting what seemed to be the common belief of the time, Brigadier General Oscar Koch, General Patton's intelligence officer, wrote that a capabilities approach was the only logical foundation for analysis: "No matter what the intentions of the enemy might be, he must have the capabilities to execute them…For intelligence purposes, only one thing counts: capabilities."[14] Unfortunately, this compromise approach did not solve the prediction problem. Commanders tended to disregard the doctrinal restrictions for sound justification for prioritizing enemy courses of action, and required a statement of the enemy's probable course of action in every estimate. In

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[10] Ibid., 42.

[11] *Risks*, 22.

[12] U.S. War Department, FM 101-5, *Staff Officer's Field Manual, The Staff and Combat Orders,* (Washington, D.C.: U.S. Government Printing Office, 1940), 91.

[13] Ibid.

response, intelligence officers issued such predictions regardless of the amount of reliable information at hand.[15]

In its post-war reviews of the process, the War Department concluded that the capabilities system had not improved intelligence results to any great extent. In December 1945, the Lovett Board[16] ruled that at all levels, there had been a lack of understanding of the proper function of intelligence. The board ruled that primary emphasis had been put on furnishing conclusions as to enemy intentions rather than on presenting facts bearing on the enemy situation and capabilities. The board stated that "Commanders have expected intelligence sections to tell them what the enemy is going to do, instead of presenting the facts from which the commander might make the necessary determinations or assumptions, and intelligence officers have attempted to meet the requirement." In essence, the board found the capabilities system, by retaining the core aspects of the intentions system, transferred an important command responsibility from the commander to his intelligence officer.[17]

Over two years after the Lovett Board published its findings, Lieutenant General Manton Eddy, then Commandant of the Command and General Staff College, conducted a survey to determine if the intelligence analyst should make any estimate of the enemy's most probable

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[14] Oscar Koch, *G-2: Intelligence for Patton* (Philidelphia, PA: Whitmore Publishing Company, 1971), 43.

[15] *Risks*, 22.

[16] In October 1945, Secretary of War Robert B. Patterson directed Assistant Secretary of War for Air Robert A. Lovett to organize a study group to consider the future intelligence structure of the United States. Although the committee prepared its report in little more than a week, it heard testimony and received written submissions from a number of persons who had had significant experience in the intelligence field, which seemed to give weight and authority to its recommendations.

[17] "War Department Intelligence Activities," App. B, Ann. C, p.2.

course of action.[18] Thirty-five World War II general officers and many of their former intelligence officers responded to a questionnaire developed by Eddy. These officers unanimously rejected a return to the intentions system, with the great majority indicating a preference for continued use of the capabilities system. Although they had seen some successes with the process, almost all of these leaders developed a skepticism for prediction and a respect for a capabilities approach. The response by General Jacob Devers[19] was typical:

> The commander who fixes on the action which is given the highest probability as being the enemy's intention lacks sound tactical judgement…The giving of relative probabilities in no way, under the present method, excuses a commander from giving due consideration to low-priority capabilities whose exercise by the enemy would very seriously jeopardize his mission.

The U.S. Army retained the capabilities system, but the search for alternative methods continued. In 1955, Colonel Elias C. Townsend, a World War II division-level G2,[20]concluded that although the U.S. Army had officially adopted the capabilities system, it had never really changed its predictive method of intelligence.[21] Townsend maintained that the Army actually maintained an ambiguous position on intelligence, leaning toward the capabilities system while at the same time maintaining the worst aspects of the intentions system. Instead of using the term "enemy intentions," the new term "relative probability of adoption" was used to define a measure

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[18] Eddy conducted his study in July, 1948.

[19] General Devers commanded the European Theater of Operations from May 1943 until January 1944. He served as Commander, U.S. Army Forces, North African Theater of Operations, from January through October of 1944, and commanded 6th Army Group from August 1944 until June 1945.

[20] As a Lieutenant Colonel, Townsend served as G2 of the 70th Infantry Division in 1945. As a Brigadier General, he commanded the U.S. Army Intelligence Command from November 1965 to June 1967.

[21] *Risks*, 22.

of enemy intent. The intelligence estimate still resulted in a prediction of enemy intentions by the intelligence officer.[22]

Descriptive System

Townsend approached the question of the function of intelligence with a theory different from those that produced the intentions and capabilities systems. He believed that it was not possible to predict the future reliably. In his book, *Risks: The Key to Combat Intelligence*, Townsend proposed an intelligence process that did not allow any form of prediction. In a method referred to as the descriptive system, he declared that prediction was unnecessary, and that the role of intelligence was not to eliminate uncertainty, but rather to illuminate risks for the commander.[23] The descriptive system completely rejected prediction. As Townsend wrote, "It should be accepted as a premise that the intelligence officer as of today is not able to predict enemy action with any reasonable degree of certainty. Therefore, the intelligence officer should not be required to predict, guess, or set priority on the probable actions of any enemy."[24]

Townsend saw that the basis for prediction was unreliable. He discounted prediction due to the unreliability of "indicators," or supposed evidence of threat activity.[25] In the descriptive

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[22] Ibid.

[23] Ibid., 21.

[24] Ibid., 29.

[25] The U.S. Army defines indicators as "Positive or negative evidence of threat activity or any characteristic of the AO which points toward threat vulnerabilities or the adoption or rejection by the threat of a particular capability, or which may influence the commander's selection of a COA. Indicators may result from previous actions or from threat failure to take action." (*Intelligence Preparation of the Battlefield*, Glossary, p.7.) U.S. joint military doctrine links indicators to warnings of enemy attack, defining "indications and warning" as "Those intelligence activities intended to detect and report time-sensitive intelligence information on foreign developments that could involve a threat to the United States or allied military, political, or economic interests or to US citizens abroad. It includes forewarning of enemy actions or intentions; the imminence of hostilities; insurgency; nuclear/non-nuclear attack on the United States, its overseas forces, or allied nations; hostile reactions to United States reconnaissance activities; terrorists' attacks; and other similar events." (*The Joint Doctrine Encyclopedia*, p.326.)

system, the analyst focused on facts related to the adversary's current situation. He developed a description of the current enemy situation and an analysis of the enemy's capabilities based on available information only. As a result, the descriptive system did not purport to provide a complete picture of the situation; high levels of uncertainty might remain. It offered only the confirmed information available, along with unconfirmed reports and unknowns, such as unlocated enemy units. Based on this information, the analyst determined those enemy capabilities that could be confirmed, those that were suspected, and those that could be denied positively.

Under this system, the commander still prioritized enemy capabilities in order to allocate his resources. However, this prioritization was based on the enemy capability that presented the greatest degree of risk to his plan. Initially, this appears to be a predictive approach, although one that shifts the burden of prediction from the intelligence analyst to the commander. However, the difference between this prioritization and the traditional forms of predictive analysis is one of purpose and effect. Under the descriptive system, the commander cannot prioritize until he has made a decision as to the friendly course of action. Essentially, the commander makes his decision based upon his own intention, not in reaction to possible enemy intentions. He then directs his resources toward ensuring his own success by securing his operation from the most threatening enemy capability. Under the descriptive system, the commander gains the initiative,[26] thereby rendering the enemy's planned course of action irrelevant to the remainder of the friendly planning process. Intelligence therefore does not drive maneuver, but protects it by identifying those capabilities that pose the highest degree of risk to the friendly plan.

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[26] "Theory of Tactical Intelligence," 19.

While the Army never adopted Townsend's descriptive system, the Army intelligence community continued its skepticism of the intentions process for many years. But by 1973, FM 30-5, *Combat Intelligence*, was rewritten directing the intelligence officer to include in every intelligence estimate a statement of all enemy courses of action "listed in order of relative probability of adoption." The U.S. Army required prediction once again.[27] Despite the findings of the Lovett Board and the Eddy Study, the Army returned to the rejected intentions doctrine. The instructions pertaining to the intelligence estimate contained in successive editions of the Army's staff operations manual, FM 101-5, clearly demonstrate this regression.[28] A comparison of each edition's requirements for information to be included in the intelligence estimate reveals a clear departure from the findings of the World War II intelligence studies. (See Appendix A, "Enemy Course of Action Requirements In Sequential Editions of FM 101-5"). Beginning in 1960, the ordering of enemy courses of action by probability no longer required justification. Unlike the 1940 and 1950 intelligence estimates, whose function was to provide the commander with a complete listing of enemy capabilities, the intelligence estimates developed since 1960 required prediction of enemy courses of action regardless of the evidence (or lack thereof) available.

During the Cold War, the U.S. Army formalized its predictive intelligence methodology in the IPB process. At the time, Soviet tactical and operational patterns were thought to be well known. IPB served as a method for predicting enemy events based on well-known patterns of enemy activity (in the form of doctrine) constrained by the effects of terrain and weather. It was

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[27] U.S. Department of the Army, FM 30-5, *Combat Intelligence*, (Washington, D.C.: U.S. Government Printing Office, 1973), J-10. Quoted in "Theory of Tactical Intelligence," 10.

[28] Douglas A. Campbell and Robert W. McKinney, "Predictive Intelligence: An Old Lesson Unlearned," *Military Review*, (August 1990): 57. This appears to be the initial compilation and comparison of this aspect of the various editions of FM 101-5.

a logical, systematic approach for predicting the actions of a doctrine-based, well-organized attacking enemy. In February 2000, the U.S. Army published the White Paper *Capturing the Operational Environment*, which described a new set of geo-political conditions in which nations, transnational actors, and non-nation entities were no longer bound by the bi-polar power structure of the Cold War. The Soviet model, as a basis for threat patterns, no longer applied. These new entities were free to challenge and redefine the global distribution of power, the concept of sovereignty, and even the nature of warfare.[29]

In response to this new understanding of the world power structure, the U.S. defense establishment shifted to a threat characterized not by its known patterns, but rather by its capabilities.[30] Its patterns may be unknown, undeveloped, or shifting in response to U.S. actions. Despite this change in the nature of the threat, IPB did not transform, but remained focused on prediction of enemy courses of action based on known or derived patterns of activity. U.S. joint military doctrine was developed that followed the same basic analytical method as IPB. Known as joint intelligence preparation of the battlespace (JIPB), this analytical process also relies on prediction through knowledge of enemy patterns of activity.

Section Two: The Contemporary Operating Environment

The COE White Paper recognizes that U.S. forces possess an overmatch of warfighting capabilities relative to near-peer adversaries in conventional fights. The paper concludes that it is therefore unlikely that any thinking opponent will seek to fight the U.S. military in a conventional

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[29] United States Army White Paper, "Capturing the Operational Environment", [CD-ROM] , (Fort Leavenworth, Kansas: Battle Command Training Program, 2000), 2.

[30] The capabilities-based approach to defense reflects the fact that the United States cannot know what nation, combination of nations, or non-state actor will pose threats to U.S. interests. *Quadrennial Defense Review Report 2001*, p.13; accessed 23 February 2004; available from http://www.defenselink.mil/pubs/qdr2001.pdf, Internet.

force-on-force scenario until they develop doctrine, structure, or technology that provides them with an advantage under circumstances of their choosing. The paper also recognizes that the U.S. will not always be able to bring the full scope of its military capability to bear, particularly in small-scale contingencies and Stability and Support Operations (SASO). Therefore, although U.S. conventional capabilities are currently unmatched, under certain conditions the normal advantages may not exist for U.S. forces.

The White Paper recognizes the potential benefit of these asymmetries between opposing forces. It describes two types of asymmetries. The first are those that are deliberate and developed over time and after careful study of potential threats. In time, these asymmetries become predictable actions or capabilities as they are adopted into standing forces. The second type of asymmetry is developed in the course of events, as opportunities present themselves. It involves multifaceted means with very flexible methods of operation. The COE White Paper characterizes these asymmetries as "harder to predict" and "significantly more dangerous" than those developed through a formal process. The paper finds that, in general, asymmetrical strategies and tactics will complicate the future battlespace and challenge intelligence and maneuver operators to devise countermeasures to defeat these actions.[31]

These asymmetries are harder to predict than conventional means, resulting in stress on intelligence systems. This is similar to the environment described in *Joint Operations Concepts.*[32] Overall, the strategic environment is portrayed as "dynamic, uncertain, and

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[31] *Operational Environment*, 8.

[32] "Joint Operations Concepts," 2003, Available from http://www.dtic.mil/jointvision/secdef_approved_jopsc.doc, Internet, Accessed December 16, 2003. "Joint Operations Concepts" (JOpsC) is a living family of documents that forms the framework for future full-range military operations. It also encompasses and unifies subordinate operating, functional, and

complex."[33] The *Joint Operations Concepts* describes potential adversaries as adaptive, and capable of determined action with destructive technologies. Readers are warned that unique cultural, political, and geographical factors might enhance enemy capabilities and make enemy behavior difficult to predict. Likely enemy actions, such as blurring the distinction between combatants and non-combatants or operating from ungoverned territories and urban areas, will challenge U.S. forces further. Because of American technological advantages, enemies will disguise their behavior and "avoid U.S. strengths and exploit our perceived weaknesses."[34] The threat is now characterized not by its known patterns of activity, but rather by its capabilities. As these patterns are now nascent, or shifting in response to U.S. actions, the problem for intelligence analysts is not just that potential threats are different or greater in number, but that the nature of the threat environment has changed fundamentally.[35] More specifically, the COE White Paper sees the future environment as "unpredictable" and possessing "greater uncertainty" than the Cold War environment.[36]

The COE is more than doctrinal speculation. Both the change in the threat and the transitory nature of enemy patterns of activity can be seen in the U.S. Army's recent experiences in Operation Iraqi Freedom (OIF).[37] According to Lieutenant General William S. Wallace, the

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enabling concepts, as well as integrated capabilities. These documents describe how the joint force will operate in the next 15-20 years.

[33] The paper lists "increasing political, economic, ethnic and religious divisions, globalization, the diffusion of power to hostile non-state actors, population growth, urbanization , a scarcity of natural resources, and the proliferation of dangerous technologies and weaponry" as some of the factors that contribute to the complexity and uncertainty of war. "Joint Operations Concepts," 7.

[34] Ibid., 7-9.

[35] Bruce D. Berkowitz and Allan E. Goodman, *Best Truth: Intelligence in the Information Age* (New Haven, CT: Yale University Press, 2000), 8.

[36] *Operational Environment*, 15.

[37] On March 19, 2003, United States and United Kingdom forces began conducting military operations against the state of Iraq in order to end the regime of Saddam Hussein; identify, isolate and

U.S. Army V Corps Commander during OIF, intelligence analysts had difficulty determining enemy actions due to the changing organization and groupings of enemy forces. Wallace stated that "the intelligence analysts were trying to fit a pattern we were seeing into an order of battle that was increasingly irrelevant. You had this …combination of foreign fighters in different forms and Iraqi paramilitary. The paramilitary forces …had no discernable pattern."[38] If OIF is a reflection of the accuracy of the COE, and that environment truly is more uncertain than the Cold War environment, then the question of prediction as a component of warfare is vital to the U.S. military's preparations for future conflict.

Section Three: Uncertainty and the Possibility of Prediction

The question of predictability in warfare is essentially a question of eliminating uncertainty, which this monograph defines as "doubt that threatens to block action."[39] Uncertainty has four sources.[40] These are missing information, unreliable information, ambiguous or conflicting information, and complex information. Missing information is information that is unavailable; it has not been received or has been received but cannot be located when needed. Unreliable information is that which is received from a source of low credibility (or a source whose credibility is perceived to be low), even if the information is highly accurate. Ambiguous or conflicting information refers to that information that can be interpreted

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eliminate Iraq's weapons of mass destruction; to search for, capture, and drive out terrorists from the country; to collect intelligence related to terrorist networks and the global network of illicit weapons of mass destruction; to end sanctions and to deliver humanitarian support to Iraqi citizens; to secure Iraq's oil fields and resources; and to help the Iraqi people create conditions for a transition to a representative self-government. "Operation Iraqi Freedom," 2003, available from http://www.globalsecurity.org/military/ops/iraqi_freedom.htm, Internet, Accessed 17 February 2004.

[38] Joy Pariante, "Wallace Discusses OIF Intel at Huachuca," *Fort Leavenworth* (Kansas) *Lamp*, 5 February 2004, 18.

[39] John F. Schmitt and Gary Klein, "Fighting in the Fog: Dealing With Battlefield Uncertainty." *Marine Corps Gazette*, vol. 80, (1996), 62-69.

in more than one way; complex information is information in which it is difficult to integrate the different aspects of data.

While one can reduce uncertainty through the gathering of facts, one can never achieve absolute certainty due to the intangible aspects of human behavior and the uncertain causal links between human behavior and military operations. Therefore, the requirement to predict enemy courses of action is based on an unrealistic assumption of certainty and a resulting confidence in prediction, which makes the friendly command susceptible to deception and surprise. This section explores the factors that combine to create uncertainty, and therefore make prediction unfeasible. These factors include the intangible aspects of human behavior, the logical limits to the attainment of certainty through technology, and the lack of knowledge of causal relationships.

Uncertainty of Understanding and Human Behavior

Human behavior is the result of a complex interplay among three pillars: motivation, capability, and opportunity.[41] All of these pillars must be present in order for behavior to occur -- none is sufficient by itself to produce behavior. Motivation refers to the guiding factors for behavior, and includes attitudes, desires, ends, aims, goals, objectives, and desired end states. The concept of "will" is defined as the intensity or strength of motivation in the context of war. This refers to the will to resist or to continue fighting. These are emotional components and are related to the adversary's psychology, which include knowledge and perceptions of the battlefield. Capability refers to the means or resources necessary to engage in behavior, including psychological factors such as intelligence and relevant facts, and physical factors such as

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[40] Ibid., 62.

personnel, equipment, supplies, and technologies. Opportunity refers to an occasion suitable for the behavior, including factors such as geography and time.[42]

Historically, warfare has focused primarily on the opponent's capabilities, for the simple reason that enemy motivations, in the form of intentions and will, typically have proven more resistant to understanding than have capability and opportunity. Like all psychological phenomena, intentions and will are latent variables which cannot be observed directly. Their existence, direction, and strength can only be inferred by a supposed association with other, directly observable variables. While it may not be impossible to develop reliable (but indirect) measures of latent variables, such a development requires a great deal of time and other resources in terms of design, testing, and validation.[43] For practical military purposes, this implies that the enemy commander's intentions remain unclear until he is forced to reveal them, casting doubt on the analyst's ability to derive enemy intent as the basis for application of pattern or doctrine, on which predictive analysis relies.

This uncertainty of motivation, and therefore intention, both derives from and reinforces the tension of war in ways that defy prediction. In his study of battles spanning six hundred years, historian John Keegan found that the human dimension of war provided a common aspect in combat experience despite changing social, organizational, and technological factors. He observed that "What battles have in common is human: the behavior of men struggling to reconcile their instinct for self-preservation, their sense of honor and the achievement of some

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[41] Donald Chisholm, "The Risk of Optimism in the Conduct of War," *Parameters*, vol 33, (Carlisle, PA: U.S. Army War College, Winter 2003-04), 116-117.

[42] Ibid., 116.

[43] Ibid., 118.

aim over which other men are ready to kill them."[44] Similarly, the Prussian theorist Karl von Clausewitz observed that danger "is part of the friction of war."[45] That is, danger contributes to the cumulative effect of difficulties manifest in the moral, psychological, and emotional dynamics of war that interact in ways that resist quantification or prediction.

The problem is made more complex by the interactions of the opponent's leaders as a collective.[46] The analyst cannot assume that an adversary's senior leadership will reach similar conclusions as to the proper course of action. In other words, the analyst can never be certain that he has identified the true decision maker. The analyst must be concerned with both formal and informal organizational processes and the dynamics of social groups. The formal processes may be visible, but certainly the informal processes will be much less so and will require considerable human intelligence to assess – a problem made even more difficult to the extent that the culture of the adversary differs from that of the analyst.[47] These differences in culture are important, and may form the basis for the emergence of new types of threats. Some of the military forces that the U.S. now faces are at odds with what would be considered conventional military thinking.[48] The creative abilities of military thinkers throughout the world, when combined with advancements in technology and its relative accessibility, are leading to the application and

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[44] John Keegan, *The Face of Battle: A Study of Agincourt, Waterloo, and The Somme* (New York: Penguin Books, 1976), 303.

[45] Carl von Clausewitz, *On War*, trans. Sir Michael Howard and Peter Paret. (Princeton, NJ: Princeton University Press, 1976/84), 113-114.

[46] "Risk of Optimism," 118.

[47] Ibid., 117.

[48] *Best Truth*, 104.

development of new forms of warfare, along with the innovative modification of more traditional military practices.[49]

In addition to uncertain individual and collective motivations, predictive analysis is made less feasible through the interactive nature of war, or the way that each sides' actions influence the decision making of the other side. Among the many factors that cause uncertainty in war, Karl von Clausewitz identified the interaction or non-linearity of war.[50] He found that war is an interaction of opposites, in which the various factors influencing war interact with one another, making linear progression toward goals and objectives impossible.[51] Clausewitz presented his theory of war as "an object suspended between three magnets" of the "blind natural force of violence, hatred, and enmity… chance and probability… and war's rational subordination to the policy of government."[52] These factors exist in an unstable environment, creating continuous interactions and creating so many possibilities that prediction becomes impossible.[53] U.S. military doctrine is particularly susceptible to faulty predictions arising from the interaction of war, because it requires predictions of enemy courses of action to drive maneuver planning. As the friendly commander arrays forces based on assumed future enemy activities, the enemy commander, unless deprived of intelligence collectors, becomes aware of this disposition of forces and changes his plan accordingly. The friendly intelligence analyst, even if his initial prediction of enemy intent was correct, now has his prediction rendered invalid due to the interaction of war and its influence on motivation.

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[49] Ibid.

[50] Clausewitz identifies the various causes of uncertainty in *On War* on pp. 80-90, 101, 113-114, 117-118, 119-121, 136-140, 148-150, 161, 184-191,198-203, 577-578, 585, 605-610.

[51] Ibid., 139.

[52] Ibid., 89.

The dynamics of human motivation are recognized in modern efforts to examine the variables of war. In his book *Numbers, Prediction, and War: The Use of History to Evaluate and Predict the Outcome of Armed Conflict*, T.N. Dupuy identifies 73 separate combat variables, at least eight of which he classifies as intangible.[54] Dupuy uses these variables to analyze military operations through a process he calls the Quantified Judgment Method of Analysis, or QJMA. It is interesting to note that despite Dupuy's exhaustive analysis of past conflicts and his confidence in QJMA's ability to model the outcome of those conflicts, he remains skeptical as to the application of his method (or any method) to predict future combat outcomes. He states that while QJMA is historically valid and can accurately represent the engagements of World War II and the Arab-Israeli Wars, such representation provides no basis for confidence in the QJMA's ability to predict the future. Dupuy wrote that "There is no known methodology, no conceivable methodology, that can accurately predict future events. This of course applies to all models used for predictive purposes."[55] Dupuy, for all his certainty of past events, is unable to overcome the uncertainty of the future. This appears to be a result of the intangibles inherent in the moral domain of war.

The possibility of prediction within the moral domain of war is perhaps best summed up by the historian Martin Van Creveld, [56] who wrote that war consists of two independent wills

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[53] Alan D. Beyerchen, "Clausewitz, Nonlinearity and the Unpredictability of War", *International Security*, vol. 17, no. 3 (Winter 1992), 59-90.

[54] T.N. Dupuy, *Numbers, Prediction, and War: The Use of History to Evaluate and Predict the Outcome of Armed Conflict* (Fairfax, Virginia: HERO Books, 1985), 32-33. The intangibles are the effects of close air support on morale, the disruptive effect of interdiction, morale, time, space, momentum, intelligence, and technology.

[55] Ibid., 147.

[56] Martin van Creveld holds degrees from the London School of Economics and The Hebrew University in Jerusalem, where he has been on the faculty since 1971. He is the author of fifteen books on military history and strategy, of which *Command in War* (1985), *Supplying War* (1977), and *The Sword*

confronting each other, and even though each of the contending opponents is to some extent bound by the nature of his means and the environment in which he operates, neither those means nor that environment is ever so constraining as to preclude considerable freedom of action. "With each side free," Van Creveld wrote, "the progress of the struggle between them is largely unforeseeable. Consequently, the attainment of certainty is, *a priori*, impossible."[57]

Uncertainty and Technology

Advances in technology would seem to promise an alleviation of uncertainty; the *Joint Operations Concepts* describes how the joint force will employ emerging capabilities and concepts, along with interagency and multinational coordination, to resolve war and crisis situations. The result is to be an operational context for the transformation of the U.S. armed forces for future joint operations, as well as a foundation for joint, service, combat support, and defense agency concept development and experimentation. However, the *Joint Operations Concepts* contains several weaknesses and contradictions, as pointed out by H.R. McMaster[58] in his paper, "Crack In The Foundation: Defense Transformation and the Underlying Assumption of Dominant Knowledge in Future War."[59] All of these weaknesses are the result of an assumption of near certainty in future conflict. The contradictions arise mainly from the tension between the

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and the Olive (1998) are among the best known. Van Creveld has lectured or taught at many military and civilian strategic institutes in the Western world, including the U.S. Naval War College.

[57] Martin van Creveld, *Command in War* (Cambridge: Harvard University Press, 1985), 266.

[58] McMaster is a national security affairs fellow at the Hoover Institution. He holds a Ph.D. in American History, and is the and author of *Dereliction of Duty: Lyndon Johnson, Robert McNamara, the Joint Chiefs of Staff and the Lies That Led to Vietnam*, as well as numerous articles on historical and national security affairs topics. The Hoover Institution on War, Revolution and Peace, Stanford University, is a public policy research center devoted to advanced study of politics, economics, and political economy-both domestic and foreign-as well as international affairs.

[59] H.R. McMaster, "Crack In The Foundation: Defense Transformation and the Underlying Assumption of Dominant Knowledge in Future War" *Student Issue Paper* vol. S03-03, (Carlisle, PA:

assumption of near-certainty and the realities of both the strategic environment and the likely characteristics of future enemies.

Although the *Joint Operations Concepts* describes an uncertain environment characterized by an adaptive enemy, it does not explain how specific obstacles to certainty might be overcome. A contradiction exists between the assumption of information superiority[60] in future war and the uncertain security environment.[61] The *Joint Operations Concepts* envisions "Full Spectrum Dominance," which is the defeat of any adversary or control of any situation across the range of military operations.[62] This control is based on the capability to "sense, understand, decide, and act faster than any adversary in any situation."[63] Leaders will benefit from a degree of certainty that will allow "decision superiority," or the ability to turn an information advantage into a competitive advantage.[64]

However, this potential competitive advantage is offset by the fact that as technology advances, new sources of uncertainty emerge. Precision weapons, for example, demand better intelligence. The speed, precision, lethality, and range of weapon systems have compressed events in time such that commanders must make decisions faster and therefore have less time to process and evaluate intelligence. Improved data collection will likely result in faster decision cycles, with plans made at the same level of uncertainty as before, due to the expectation of faster

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Center for Strategic Leadership, U.S. Army War College, Nov. 2003, accessed 15 November 2003); p.1. Available from http://www.carlisle.army.mil/usacsl/Publications/S03-03.pdf, Internet.

[60] JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, J-7, Joint Staff, 2002, *Joint Electronic Library* [CD-ROM], 211. The publication defines information superiority as "That degree of dominance in the information domain which permits the conduct of operations without effective opposition."

[61] "Crack in the Foundation," 7.

[62] "Joint Operations Concepts," 10.

[63] Ibid.

decisions enabled by communication technology, but without the time allowed in the past for thoughtful reflection.[65] Additionally, the sheer volume of information available and the fact that much of it is conflicting or irrelevant "noise" confuses situations further.[66] Van Creveld wrote that there exist certain logical obstacles to attaining certainty. The basis of his argument is that in order to attain certainty, one needs all relevant information. However, the more information available, the longer the processing time required and the greater the difficulty in distinguishing between useful and useless information. Van Creveld characterized this as a "self-defeating dilemma."[67] It seems that uncertainty is and will be inevitable, although it is likely that the information age will redefine the challenges posed by uncertainty. Decision-makers will still be confronted with missing information, but where previously, information was missing because it was uncollected, in the future information will be missing because it cannot be found.[68]

Uncertainty of Pattern and Causality

The difficulty in templating enemies in the COE is due in part to changing patterns of operation, or to the lack of established patterns. The White Paper says that there will be no apparent "logical laydown" for how the threat employs his forces, and that "no two fights will be the same. Patterns will be avoided."[69] This lack of pattern has the potential to create uncertainty in the form of ambiguous or conflicting information, as the analyst attempts to discern patterns or doctrine from a constantly adapting adversary. Essentially, there are two types of changes that

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[64] Ibid., 18.

[65] Gary Klein, *Sources of Power* (Cambridge, Massachusetts: The MIT Press, 1998), 279.

[66] "Crack in the Foundation," 16.

[67] *Command in War*, 267.

[68] *Sources of Power*, 279.

[69] *Capturing the Operational Environment*, 21.

must be predicted: regular, or cyclical changes (e.g., the changing seasons), and discontinuous changes – those that occur on a one-time, *ad hoc*, basis.[70] Examples of these are technological innovations, price increases, shifts in consumer attitudes, and government legislation. It is, of course, logical to expect that humans can predict the future by observing regularities in natural phenomena (for example, lunar phases or the changing seasons). Prediction is also possible when dealing with causal relationships, as long as there is some understanding of the causality involved. Examples of this are the planting of seeds and the resultant growing of crops, or intercourse and resultant pregnancy.

A prerequisite of any form of prediction, then, is a pattern or relationship existing between events.[71] However, when dealing with discontinuities (i.e., one-time events, or changes that never occurred before), prediction becomes very nearly impossible.[72] The required understanding of causal relationships is usually absent, which allows too many factors to intervene and skew the prediction.[73] Given that predictive analysis is based largely on knowledge of cyclical patterns in the form of doctrine or established procedures, the discontinuous nature of the COE is at odds with current U.S. military analytical methods. The construct for predictive analysis is based on the unfounded assumption that technologies and sound analysis will dissipate uncertainty in war. The problem is that as analysis progresses from data, to understanding, and then to knowledge, the resultant possibilities – and therefore uncertainties – increase in an

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[70] Henry Mintzberg, *The Rise and Fall of Strategic Planning* (New York: The Free Press, 1994), 228.

[71] Spyros Makridakis, *Forecasting, Planning, and Strategy for the 21st Century*, (New York: Free Press, 1990), 56.

[72] Spyros Makridakis and M. Hibron, "Accuracy of Forecasting: An Empirical Investigation. *Journal of the Royal Statistical Society* (CXLII, Part 2, [Series A], 1979), 115.

[73] *Rise and Fall*, 231.

exponential manner.[74] Put another way, every confirmed fact will lead to numerous reasonable inferences. These in turn lead to what could be nearly countless plausible eventualities. Even if sensors were able to identify all enemy positions, the human and psychological dimensions of war would preserve uncertainty,[75] making the reliance on prediction in future conflict dangerously optimistic.

The Risks of Prediction: Deception and Surprise

This is not to imply that current or future adversaries are so capable as to never fall into predictable patterns; certainly they will. But as the Chinese theorist Sun Tzu pointed out, manipulation of pattern offers the potential for surprise. That is, an effective commander can hide his intentions and make himself unpredictable through misdirection or formlessness -- never repeating the same plan, and continuously changing military doctrine.[76] This fact is recognized by the COE White Paper, which states that "the key for the threat is surprise. Surprise in terms of when, where and how the fight takes place" along with "the method by which weapons systems are deployed/employed."[77] This is an exploitation of the Recognition Primed Decision (RPD) model, which asserts that decision makers draw upon their experience to identify a situation as representative of or analogous to a particular class of problem. This recognition then leads to an appropriate course of action, either directly when prior cases are sufficiently similar, or by adapting previous approaches.[78] Given the unmatched military capability of the United States, it seems likely that the twenty-first century will see the attainment of surprise emerge as a priority

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[74] "Fighting in the Fog," 64.

[75] "Crack in the Foundation," 14.

[76] Michael I. Handel, *Masters of War* (Portland, Oregon: Frank Cass Publishers, 2001), 236.

[77] *Operational Environment*, 21.

for potential adversaries. As Robert Leonhard[79] puts it in *The Principles of War for the Information Age*, "information warfare will see a constant battle between stealth and data fusion, between knowledge and ignorance, and between truth and deception. Surprise…will be fundamental to Information Age warfare."[80]

Deception is defined by the U.S. military as those measures designed to mislead the enemy by manipulation, distortion, or falsification of evidence to induce him to react in a manner prejudicial to his interests.[81] The U.S. Army defines surprise as a strike at the enemy at a time or place or in a manner for which he is unprepared.[82] These are essentially psychological effects, occurring in the mind of the recipient. These two concepts are also difficult to separate – they remain closely related, as deception provides one of the most effective ways to achieve surprise.[83] Sun Tzu seemed to recognize that the psychological nature of man enables his perceptions to be manipulated,[84] and makes him vulnerable to deception and surprise. Sun Tzu saw that those convinced of their own superiority are often oblivious to the need to be on guard against deception. [85] In his work *The Art of War,* he stated, "When capable, feign incapacity, when

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[78] *Sources of Power*, 17.

[79] Robert R. Leonhard is an active duty U.S. Army officer currently serving as professor of Military Science at West Virginia University. In addition to the work cited, he is the author of *The Art of Maneuver* and *Fighting by Minutes.*

[80] Robert R. Leonhard, *The Principles of War for the Information Age* (Vovato, CA: Presidio Press, 2000), 193.

[81] *Dictionary of Military and Associated Terms*, 118.

[82] U.S. Department of the Army, FM 3-0, *Operations* (Washington, D.C.: U.S. Government Printing Office, 2001), 4-14.

[83] *Masters of War*, 215.

[84] Ibid., 218.

[85] Ibid., 218.

active, inactivity ... Offer the enemy a bait to lure him... feign disorder and strike him."[86] He also advised to "pretend inferiority and encourage his arrogance." [87]

Sun Tzu advocated the use of deception on all levels, including the highest strategic and operational levels, where, according to him, it could be very effective. For Sun Tzu, war (and often politics) could be equated with deception. Clausewitz disagreed. His belief that friction, chance, and uncertainty dominate war convinced him that surprise on the strategic and higher operational levels was practically impossible.[88] He wrote that it would be a mistake to regard surprise as a key element of success in war, and while surprise may be highly attractive in theory, in practice it is likely to be overcome by the accumulation of difficulties, or the "friction" of war. Clausewitz concluded that surprise is a tactical device due to the limited scale and time involved at the tactical level of war, but that it becomes more difficult as one approaches the higher levels of policy.[89]

Michael Handel, [90] in his examination of the uses of deception throughout history, notes that today the opposite is true. In the modern world, strategic mobility, long-range delivery

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[86] Sun Tzu, *The Art of War*, trans. Samuel B. Griffith (New York: Oxford University Press 1971), 66.

[87] Ibid., 67.

[88] *Masters of War*, 226.

[89] *On War*, 198-199.

[90] Michael Handel was a Professor of Naval Strategy at the U.S. Naval War College from 1990 to his death in 2001. He was an expert on strategic theory, the nature and operations of war, and the future of warfare. He held a Ph.D in Government from Harvard University. He was Professor of National Security Affairs at the U.S. Army War College from 1983-1990, and was a member of the Olin Institute for Strategic Studies at the Center for International Affairs at Harvard. He was the founder and U.S. editor of the journal *Intelligence and National Security*, and author of numerous books on theory and practice of war, including *Masters of War, Intelligence and Military Operations*, and *War, Strategy, and Intelligence*. He was an authority on the problem of strategic surprise, and on the methodology and theoretical aspects of intelligence. His interests included the future of naval warfare and the role of navies in intervention. At the time of his death, he was working on a book on multi-front warfare, and on studies of comparative strategic theory.

systems, and increased firepower have made it easier to achieve strategic surprise, while the development of radar and other sensors has made operational and tactical surprise more difficult.[91] He goes on to conclude that the industrial revolution transformed strategic and operational surprise into realistic options due to great improvements in mobility, firepower, and real-time communications. Handel theorizes that once surprise became an integral part of warfare, the value of deception grew.[92] Consequently, Sun Tzu's insistence that all warfare is based on deception becomes more relevant in the contemporary operating environment than Clausewitz's dismissal of its value. Deception and surprise are the real dangers of prediction. Yet current U.S. military doctrine demands prediction, while offering no real method for the mitigation of deception and surprise.

Section Four: Expectations for Prediction

Today's U.S. Army and Joint doctrine clearly expresses an expectation for predictive results from intelligence analysis. This section explores the U.S. military's doctrinal expectations for predictive results from intelligence analysis. Through an analysis of the Joint Intelligence Preparation of the Battlespace (JIPB) process, in particular the standards applicable to projected enemy courses of action, this section reveals discrepancies between the expectation for prediction and the ambiguities resident in the COE.

The U.S. military's current theory is that intelligence must not only describe the current battlefield environment, but must also predict the enemy commander's chosen course of action and his intentions for the future. The U.S. Army's capstone operations manual, FM 3-0, *Operations*, states that "…IPB allows commanders to fill gaps in information about the enemy

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[91] *Masters of War*, 229.

[92] Ibid., 230.

with informed assessments and predictions" and requires an assessment of most likely enemy courses of action through "informed prediction."[93] This expectation is also clear in the description of IPB provided in FM 34-130, *Intelligence Preparation of the Battlefield.* This manual assures the analyst that accurate analysis of the environment and the threat force will lead to valid predictions of the enemy courses of action.[94] It instructs the analyst to "replicate the set of COAs [courses of action] that the threat commander and staff are considering", and goes so far as to promise the attainment of certainty, proposing that successful analysis will result in avoidance of "an unanticipated threat action." This is because the analyst "will be able to quickly narrow the set of possible threat COAs to the one [the enemy] has chosen."[95]

Uncertainty in the JIPB Process

The most up-to-date representation of this predictive analytical method is contained in the U.S. military's joint doctrine.[96] Joint Publication 2-01.3, *Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace,* describes a four-step process for the analysis of the environment and the adversary.[97] The process described in this manual presupposes knowledge of enemy patterns and doctrine, although, as will be shown, each step in the process is susceptible to some level of uncertainty. While it does describe a variety of pitfalls associated

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[93] *Operations*, 5-4, 11-9. The term "informed prediction" is not defined, but suggests a linear, systematic analysis of the battlespace leading to conclusions as to the battlespace's future state. This provides an interesting contrast with the 1941 version (then numbered FM 100-5), that stated the commander "must guard against the unwarranted belief that he has discovered the enemy's intentions…" p.26.

[94] *Intelligence Preparation of the Battlefield* , 1-3.

[95] Ibid., 2-39.

[96] *Intelligence Preparation of the Battlefield* is currently being re-written, to be published as FM 2-01.3. A review of a draft edition does not show a significant change from the predictive approach contained in current U.S. joint and Army doctrine.

with these assumptions, it offers no realistic solutions to the enemy's potential to achieve surprise.

As the analyst moves through the JIPB process, he confronts uncertainty on three different levels. These are data, knowledge, and understanding.[98] Data is the base level of uncertainty, and encompasses doubt as to factual information, such as existing conditions (which may be measurable, although not necessarily easy to collect.) Examples of uncertainty of data include the locations of enemy units, types and amounts of available equipment, and the condition of the terrain. The second level of uncertainty is that of knowledge, which reflects the lack of certainty in the inferences that the analyst makes from available factual information. This level of uncertainty appears as the analyst considers known facts and develops them into assumptions about the battlefield. For example, facts may show a certain level of obstacle construction by the enemy; the resulting inference may be that the enemy is preparing a defense. Understanding is the third level of uncertainty. This uncertainty results from the synthesis of inferences into projections of future events. An example might be that the enemy's defensive preparations are indicative of his inability to conduct an attack, and therefore his intention to conduct a defensive operation. This uncertainty of understanding is problematic because it demands inferences into the motivations for human behavior, and conclusions as to how those motivations will manifest themselves in future activity.

In the first step of the JIPB process, Define the Battlespace Environment, the analyst determines the dimensions of the battlespace by identifying the important characteristics and

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[97] JP 2-01.3, *Joint Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace.* J-7, Joint Staff, 2002, *Joint Electronic Library* [CD-ROM] The description of the JIPB process contained in this monograph is taken from chapter two of JP 2-01.3

[98] "Fighting in the Fog," 64.

gathering information related to the environment and the adversary. This would seem to be a straightforward process, and for the most part, it is. However, this step reflects the possibility of uncertainty at the first level, that of data. Although the type of data required for this step in the process may be easy to measure, it is still vulnerable to sources of uncertainty in the form of missing information, either because the required data has yet to be collected, or because no one has realized the need to collect it. Examples of this in a military context may be data related to social factors which prove to affect operations, but that remain missing because the analyst is unaware of the existence of that particular social factor. Data missing during this step has the potential to skew the analysis in subsequent steps.

The second step in the JIPB process, Describe the Battlespace's Effects, reveals a transition from uncertainty of data to that of uncertainty of knowledge. During this step, the analyst evaluates the effects of the battlespace environment on both adversary and friendly military operations, beginning with the identification and analysis of all militarily significant environmental characteristics, both existing and projected. These environmental factors are then analyzed to determine their effects on the capabilities and broad courses of action of both adversary and friendly forces. These inferences all contain the potential for uncertainty of knowledge, as does the third step in the JIPB process, Evaluating the Adversary. In this step, the analyst identifies and evaluates the adversary's military and relevant civil centers of gravity, critical vulnerabilities, capabilities, limitations, and the doctrine and techniques employed by adversary forces, absent constraints imposed by the battlespace environment. During this step, the analyst develops models that "accurately portray how adversary forces normally execute operations" or how they have reacted to specific military situations in the past. Again, the analyst is confronted with the possibility of uncertainty of knowledge as he attempts to infer from available information the adversary's doctrine, true center of gravity, and vulnerabilities. Just as in the first step of JIPB, several sources of uncertainty are present, including missing, unreliable,

and ambiguous information. U.S. President George Bush's recent acknowledgement that he was surprised by the lack of weapons of mass destruction in Iraq highlights the existence of these uncertainties even on the strategic level. [99]

The fourth step of the JIPB process is Determining Adversary Courses of Action. It seeks to go beyond the battlespace awareness achieved during the previous steps in order to help attain "a detailed understanding of the adversary's probable intent and future strategy."[100] The process for step four provides a disciplined methodology for identifying the course of action that the adversary is most likely to adopt, as well as the course of action that would be most dangerous to the friendly force or to mission accomplishment. This process begins with an identification of the adversary's likely objectives and desired end state. These are identified by analyzing the adversary's current military and political situation, strategic and operational capabilities, and the characteristics of the adversary nation. The manual instructs the analyst to begin by identifying the adversary's overall strategic objective, which will form the basis for identifying subordinate objectives and desired end states. The publication cautions that there will not always be sufficient information available to state adversary objectives as fact. In such cases, the analyst is to identify likely objectives as assumptions.

Once objectives and end states are determined, the analyst must identify the full set of courses of action available to the enemy. The manual states that at a minimum, the analyst must determine all courses of action that the adversary's doctrine considers appropriate to the current situation and accomplishment of likely objectives; all adversary courses of action that could significantly influence the friendly mission "even if the adversary's doctrine considers them

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[99] Dana Milbank, "Bush Was Surprised At Lack of Iraqi Arms," *Washington Post*, 9 February 2004, 7.

suboptimal under current conditions," and all adversary courses of action indicated by recent activities or events. This requirement leads the analyst to the third level of uncertainty, that of understanding. The inferences developed in the previous steps of JIPB lead to a great many plausible eventualities, making an accurate determination of the adversary's course of action difficult at best. A review of the criteria required to judge a potential course of action as valid further reveals these difficulties.

Enemy COA Criteria

Each identified course of action is expected to meet the five criteria of suitability, feasibility, acceptability, uniqueness, and consistency with adversary doctrine. Examination of these criteria reveals inherent inconsistencies between the expectation for prediction contained in U.S. military intelligence doctrine and the unpredictable nature of adversaries in the COE. The exception is the criterion of uniqueness, which simply requires that each of the analyst's proposed adversary courses of action be significantly different from the others. This criterion will not be discussed further.

The criterion of suitability measures the analyst's proposed adversary course of action against the adversary's potential to accomplish his likely objective or desired end state.[101] While this is a logical basis for suitability, the difficulty lies in the assumption as to the adversary's objective and end state. Recall that motivation is one of the three pillars of human behavior. Intentions and will are resistant to understanding, difficult to measure in terms of counter-effects, and subject to distortion through the collective interaction of decision makers and the differences in culture between the analyst and the object of the analysis. Therefore, the ability of the analyst

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[100] *Joint Intelligence Preparation of the Battlespace,* II-53.

to determine the adversary's likely objective and desired end state is doubtful in the first place, making the inferences drawn from these assumptions, including courses of action, invalid.

The criterion of feasibility limits the proposed adversary course of action to one able to be executed with the time, space, and resources available to the enemy.[102] In terms of human behavior, this is the capability pillar, which in general is more suited to understanding than motivation in the form of desired end states, but not completely without problematic aspects. Assuming that the analyst has some reasonable indications as to the enemy's time, space, and resource constraints, the analyst must still fit these into a coherent framework based on the analyst's own preconceptions of the battle space. That is, the analyst must allow the evidence to shape conclusions, rather than using evidence in a selective way to fit his biases – a danger that the manual points out when it encourages the analyst to "always try to anticipate innovative or seemingly radical measures the adversary may adopt."[103] This problematic aspect of the feasibility criterion is compounded by the requirement to balance it with the criterion of acceptability.

The acceptability criterion rules out potential enemy courses of action that exceed the level of risk acceptable to the adversary. The analyst determines the adversary's level of acceptable risk by analyzing past adversary military activity, current order of battle, and the psychological profiles of adversary leaders. The manual cautions that in some instances, an opponent "may be willing to tolerate a higher level of risk than normal," particularly if a risky

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[101] Ibid., II-54.

[102] Ibid.

[103] Ibid.

course of action is the only means of accomplishing the objective.[104] This may prove exceedingly difficult, as adversaries in the COE may offer little in the way of past activity, and the actual adversary decision-maker may be unknown. Even if the analyst does know the identity of the decision maker, and can be reasonably certain that he can analytically insulate this decision maker from the collective of adversary leaders, the problem of uncertainty of human motivation still exists. Further, the acceptability criterion demands some understanding of past adversary activity, which may not be available. This is also a factor in the final criterion, consistency.

The criterion of consistency with doctrine requires that the course of action be in accordance with the adversary's doctrine, tactics, and observed practices. The manual advises the analyst to guard against an adversary's attempt to achieve surprise by deliberately deviating from known doctrine. Additionally, the manual points out that the availability of new technology or desperation may drive an adversary to deviate from past doctrine, and challenges the analyst to "anticipate such changes."[105] The discrepancy between the criterion and the nature of the battlespace environment described in the COE are obvious, in that the COE discounts a coherent pattern of threat employment. Even if a pattern was to form over time, it will not help the analyst who is looking at a new adversary or planning for operations in a new theater, before such patterns have developed.

In progressing through the JIPB process, the analyst confronts uncertainty on several levels, calling into question the validity of analytical conclusions based on this predictive process. Analysts attempting to define the battlefield environment are subject to uncertainty of data in the form of missing information. In describing the battlespace's effects, the analyst faces the

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[104] Ibid.

[105] Ibid., II-55.

possibility of uncertainty of knowledge, as he infers effects based on the incomplete information used in the initial JIPB step. This uncertainty is also found in the analyst's attempt to evaluate the adversary, when the analyst must infer from the available data the adversary's doctrine, center of gravity, and vulnerabilities. These various sources of uncertainty build upon one another, with a resulting uncertainty of understanding as to the enemy's chosen course of action. The JIPB's requirement that enemy courses of action conform to the criteria of suitability, feasibility, acceptability, and consistency with doctrine also contributes to the unfeasibility of this predictive process, as unknowns such as the adversary's desired end state, level of acceptable risk, and lack of pattern or doctrine combine to create an uncertain environment resistant to prediction. This process of predictive analysis has been characterized as a series of "sophisticated guesses at where the enemy is and what he might do."[106]

The research presented in this monograph suggests that this predictive approach did not work in World War II, because the moral dimension of war and uncertainty as to cause and effect did not form a sound basis for prediction. In the contemporary operating environment, prediction in the form of "sophisticated guesses" may not only be unfeasible, but dangerous as well – a danger recognized by the U.S. military. *Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace* offers several cautions related to the use of predictive analysis. It describes joint intelligence preparation of the battlespace as useful for "formulating a hypothesis regarding the adversary's possible adoption of various COAs (i.e., what the enemy *may* do)," but cautions that JIPB "…should *not* be considered a 'crystal ball' for predicting the adversary's actual intentions (i.e., what the enemy *will* do)." The publication then explains that "the JIPB analyst estimates the most likely adversary COA based largely on…assumptions about

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[106] *Principles of War*, 18.

the adversary that may prove invalid. Campaign planning based solely on countering the most likely COA will leave the joint force vulnerable to other less likely COAs that the adversary may choose to adopt in order to maximize surprise."[107] The joint publication states that the analyst must be constantly on guard against possible adversary deception efforts, warning that the adversary may deliberately adopt a less than optimum COA in order to maximize surprise. Additionally, the adversary may gradually increase preparations for a specific COA over a lengthy period of time, thereby "psychologically conditioning" the analyst to accept a level and type of adversary activity previously considered to be abnormal as a new norm.[108]

The joint publication also recognizes the interactive nature of war, stating that actions associated with a friendly course of action may cause the adversary to change to a different course of action other than the one originally adopted. Therefore, the adversary's reaction to changes in friendly force dispositions should be continuously analyzed to determine if the adversary has changed to a different course of action. This, in turn, may require a reprioritization of the initial list of adversary courses of action.[109] In other words, as the friendly commander acts based on prediction of the future state of the enemy, the enemy reacts, changing the initial set of conditions from which the analyst made his prediction. This increases uncertainty of data, knowledge, and understanding.

Despite this recognition of the dangers associated with predictive analysis, U.S. military doctrine clearly shows an expectation for prediction from the intelligence process. It assumes that prediction is possible, and espouses a methodology to achieve predictive results. However, this methodology is based on assumptions that presuppose an adversary with a developed

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[107] *Joint Intelligence Preparation of the Battlespace,* I-6.

[108] Ibid., II-56.

doctrine or well-developed patterns of operation -- assumptions that leave the U.S. military exposed to the potential of surprise from an adaptive adversary. This suggests that predictive analysis is not feasible for operations in the COE, and that the U.S. military should consider alternate methods for planning and conducting operations.

Section Five: Conclusions and Recommendations

The construct for predictive analysis is based on the unfounded assumption that technologies and sound analysis will dissipate uncertainty in war. U.S. military doctrine shows an expectation for prediction from the intelligence process; it assumes that prediction is possible, and details a methodology to achieve predictive results. However, this methodology is based on assumptions that presuppose an adversary with a developed doctrine or well-developed patterns of operation. Given that predictive analysis is based largely on knowledge of cyclical patterns in the form of doctrine or established procedures, current U.S. military analytical methods are at odds with the existing geo-political environment. This is not to suggest that predictive intelligence is completely impossible. Indeed, some talented or fortunate analyst working in an environment with limited variables could potentially predict enemy intentions and courses of action. Predictive analysis may still have its place – against a well-known, conventional peer competitor, or against a more unconventional foe who falls into recognizable patterns over time. Still, research suggests that predictive analysis is not feasible for operations in the COE due to the environment's discontinuous nature, inherent unpredictability, and the resultant level of risk to the friendly force as adversaries make the attainment of surprise a priority.

The U.S. military is in need of an alternative method of intelligence – one that does not rely on prediction (and its subsequent reactive approach and risk of surprise) but rather one that

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[109] Ibid., II-53-II-56.

works within the realm of uncertainty and seeks to disable the enemy as an effective fighting organization, retaining initiative with the friendly force. Doctrine should give commanders and analysts the freedom to focus on enemy capabilities rather than intentions by removing the doctrinal requirement for prediction of enemy courses of action in probable order of adoption and developing a new intelligence methodology.

A modified form of the descriptive method of analysis would be such a method, resolving the dichotomy between the unpredictable nature of the environment and the requirement for predictive results from intelligence. Recall that Townsend's descriptive system rejects prediction, and instead requires the analyst to focus on facts related to the enemy's current situation. In this method, the intelligence officer develops a description of the current enemy situation and an analysis of the enemy's capabilities based only on available information. A descriptive system does not presume to provide a complete picture of the situation. It offers only the confirmed information available, along with unconfirmed reports, indicators, and unknowns, such as enemy units that are known to exist but whose current location is unknown. This method calls for enumeration of enemy capabilities that can be confirmed, those that are suspected, and those that can positively be denied.

Such a system would require a combination of the basic elements of Townsend's descriptive method with the aspects of systems analysis[110] found in *Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace.* This would result in an analytical model of the adversary as a complex system, to include aspects of the system vulnerable to attack. It provides an opportunity to examine an adversary in terms of the

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[110] Systems theory is the study of the complex interrelationships between the different elements within a system. The basic assumption in general systems theory is that generalized models, principles, and

interrelationships between his subsystems, capabilities and vulnerabilities – not his intentions. While a complete description of such a system is beyond the scope of this monograph, the following paragraphs describe the general modifications that should be made to the JIPB process in order to transform from a predictive to a descriptive system.

JIPB in a Descriptive System

The JIPB process should be modified to reflect a descriptive system of intelligence. The primary purpose of JIPB should be changed from that of supporting joint campaign planning and decision making through identification of the adversary's intentions and COAs[111] to that of supporting joint campaign planning and decision making through identification of the adversary's capabilities that pose the greatest risk to the friendly COA. The requirements to identify and assess centers of gravity, critical vulnerabilities, capabilities, and limitations should remain.[112]

The first two steps of the JIPB process should remain essentially unchanged. While these steps are still vulnerable to uncertainty due to missing or yet-to-be collected data, the effects of uncertainty are offset somewhat by the shift in emphasis from prediction to description, which requires less dramatic inferences from available facts. The third step in the JIPB process, Evaluating the Adversary, should be modified to delete the requirement for the analyst to develop models that "accurately portray how adversary forces normally execute operations" or how they have reacted to specific military situations in the past. Under a descriptive system, such models would have limited utility, because they will not be developed into specific courses of action. The requirements to identify and evaluate the adversary's military and relevant civil centers of

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laws exist and can be applied across various systems. Ludwig von Bertalanffy, *General Systems Theory*, (New York: George Braziller, 1993), p.33.

[111] *Joint Intelligence Preparation of the Battlespace*, III-1.

gravity, critical vulnerabilities, capabilities, and limitations should remain. The fourth step of the JIPB process is Determining Adversary Courses of Action. This step should be eliminated and replaced with a step in which the analyst describes the current enemy situation, with the resulting capabilities available to the enemy. The analyst (or the commander) defines the capabilities that represent the most dangerous risk to the friendly force or to mission accomplishment based on the friendly course of action. This is a prioritization of enemy capabilities, but this is not a predictive approach, as the commander cannot prioritize until he has made a decision as to the friendly course of action. He makes this decision based on his own intention, not in reaction to possible enemy intentions. This would allow the commander to gain the initiative and thereby render the enemy's planned course of action irrelevant to the remainder of the friendly planning process.

Enemy COA Criteria in a Descriptive System

Under the current JIPB process, each identified course of action is expected to meet the five criteria of suitability, feasibility, acceptability, uniqueness, and consistency with enemy doctrine. Under a descriptive system, the descriptions of the enemy situation and resulting capabilities and risk would need to meet only two criteria. The first is uniqueness, which would require that each of the capabilities the analyst describes be significantly different from the others; the second criteria is that of feasibility, which limits the proposed enemy course of action to one able to be executed with the time, space, and resources available to the enemy.[113]

While recent U.S. military doctrine has created the expectation that predictive analysis can and should serve as the driver for maneuver planning, the research contained in this monograph leads to the conclusion that predictive intelligence is not feasible in the contemporary

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[112] Ibid.

operating environment due to its reliance on patterns of enemy activity as a template for predictions of future events. Research has shown that both in theory and in practice, adversaries in the COE do not operate in readily apparent patterns. Therefore, the expectation for intelligence to drive maneuver is faulty. However, intelligence can protect maneuver through identification and enumeration of enemy capabilities using a descriptive system of analysis.

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[113] Ibid.

Appendix A: Enemy Course of Action Requirements In Sequential Editions of FM 101-5. [114]

1940: This edition required a statement of the relative probability of adoption of enemy lines of action when such statements were justified. The justification was required to consist of enemy dispositions (facts) that favored one or more capabilities and mitigated against others. Only under "exceptional circumstances" could knowledge of enemy doctrine, recent patterns, national psychology, or the mentality of the enemy commander justify a relative probability of adoption. p.91.

1950: - This edition required presentation of all possible enemy courses of action that could affect the accomplishment of the friendly mission. Required justification of the stated relative probability of adoption of enemy capabilities, as well as discussion of the effect of enemy courses of action on the friendly mission.

1954: This edition required a statement of the relative probability of adoption of enemy capabilities, if justified. Also required discussion of the effects of enemy capabilities on the friendly mission.

1960: This edition required most probable courses of action listed in order of relative probability of adoption.

1968: This edition required enemy courses of action listed in order of relative probability of adoption.

1972: This edition required enemy courses of action listed in order of relative probability of adoption.

1984: This edition required enemy courses of action listed in order of relative probability of adoption. It stated that usually no more than two or three courses of action could be justified through available evidence.

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[114] Douglas A. Campbell and Robert W. McKinney, "Predictive Intelligence: An Old Lesson Unlearned," *Military Review*, August 1990. This appears to be the initial compilation and comparison of this aspect of FM 101-5 through the 1984 edition. The 1993 through 2003 editions, as well as some additional notes on the 1940 version, were added by the author.

1993: This edition required a conclusion as to the enemy's most likely courses of action, including the relative probability of adoption. p. C-38.

1997: This edition required a determination of the threat's possible courses of action and an arrangement of them in probable order of adoption. p. 5-6.

2002: This edition, now renumbered as FM 5-0, requires a determination of the threat's possible courses of action and an arrangement of them in probable order of adoption. p. 3-15.

BIBLIOGRAPHY

"Capturing the Operational Environment." U.S. Army White Paper, Fort Leavenworth, Kansas: Battle Command Training Program, 2000. CD-ROM.

"Joint Operations Concepts." Joint Chiefs of Staff, 2003. On-line database. Available at http://www.dtic.mil/jointvision/secdef_approved_jopsc.doc. Accessed December 16, 2003.

"Objective Force Fusion." U.S. Army White Paper, Fort Huachuca, Arizona: Directorate of Combat Developments, US Army Intelligence Center, 2003. On-line database. Available at https://www.us.army.mil/portal/jhtml/dc/index.jhlml. Accessed July 9, 2003.

"Operation Iraqi Freedom," GlobalSecurity.org, 2003. On-line database. Available at http://www.globalsecurity.org/military/ops/iraqi_freedom.htm. Accessed 17 February 2004.

Quadrennial Defense Review Report 2001. On-line database. Available at http://www.defenselink.mil/pubs/qdr2001.pdf. accessed 23 February 2004.

"Report of the Committee Appointed by the Secretary of War to Study War Department Intelligence Activities," Washington, D.C.: 1945.

Adelman, Leonard, Michael L. Donnell, and Ruth H. Phelps. "Intelligence Preparation of the Battlefield: Critique and Recommendations." Alexandria, Virginia: U.S. Army Research Institute for the Behavioral and Social Sciences, 1984.

Agee, Collin A. "Intelligence Preparation of the Battlefield (IPB): One Size Fits All." SAMS Monograph, Fort Leavenworth, Kansas, 1991.

Berkowitz, Bruce D. and Allan E. Goodman. *Best Truth: Intelligence in the Information Age*. New Haven, CT: Yale University Press, 2000.

Beyerchen, Alan "Clausewitz, Nonlinearity and the Unpredictability of War," *International Security*, 17:3 (Winter, 1992), pp. 59-90.

Campbell, Douglas A. and Robert W. McKinney. "Predictive Intelligence: An Old Lesson Unlearned." *Military Review*. August 1990.

Chisholm, Donald. "The Risk of Optimism in the Conduct of War," *Parameters*, Vol 33,. Carlisle, PA: U.S. Army War College, Winter 2003-04

Chizek, Judy G. "Military Transformation: Intelligence, Surveillance and Reconnaissance." Report to Congress, The Library of Congress, 2002.

Davis, Lamar. "Predictive Intelligence: Do We Really Need It?" *Military Intelligence Professional Bulletin*, April-June 1997. On-line database. Available at

http://www.fas.org/irp/agency/army/tradoc/usaic/mipb/1997-2/davis.htm Accessed 17 December 2003.

Dupuy, T.N. *Numbers, Prediction, and War: The Use of History to Evaluate and Predict the Outcome of Armed Conflict*, Fairfax, Virginia: HERO Books, 1985.

FM 100-14, *Risk Management*, Washington, D.C.: U.S. Government Printing Office, 23 April 1998

FM 101-5, *Staff Officer's Field Manual, The Staff and Combat Orders*, Washington, D.C.: U.S. Government Printing Office, 1940.

FM 101-5, *Staff Organization and Operations*, Washington, D.C.: U.S. Government Printing Office, 1997.

FM 101-5, *Staff Organization and Operations*, Washington, D.C.: U.S. Government Printing Office, 1993.

FM 2-01.3, *Intelligence Preparation off the Battlefield* (Initial Writer's Draft). Fort Huachuca, Arizona: U.S. Army Intelligence Center, 2003.

FM 3-0, *Operations*. Washington, DC: U.S. Government Printing Office, 2001.

FM 30-5, *Combat Intelligence.* Washington, D.C.: U.S. Government Printing Office, 1973.

FM 34-1, *Intelligence and Electronic Warfare Operations*, Washington, D.C.: U.S. Government Printing Office, 1994.

FM 34-130, *Intelligence Preparation of the Battlefield* . Washington, DC: Department of the Army, 1994.

FM 5-0, *Army Planning and Orders Production* (Final Draft), Washington, D.C.: U.S. Government Printing Office, 2002.

Funkhouser, Anthony C. "An Assessment of the IPB Process at the Operational Level." SAMS Monograph, Fort Leavenworth, Kansas, 1999.

Handel, Michael I. *Masters of War.* Portland, Oregon: Frank Cass Publishers, 2001.

Herbert, Paul H. *Deciding What Has to be Done: General William E. DePuy and the 1976 Edition of FM-100-5, Operations*. Fort Leavenworth, Kansas: Combat Studies Institute, 1988.

Heuer, Richards J. *Psychology of Intelligence Analysis.* Center for the Study of Intelligence, CIA, 1999. On-line database. Available at www.cia.gov/csi/books/19104/index.html. Accessed July 9, 2003.

Howell, James. "The Development of Combat Intelligence." *Military Review*. May 1943.

JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*. Joint Electronic Library, J-7, Joint Staff, 2002. CD-ROM.

JP 2-0, *Doctrine for Intelligence Support to Joint Operations.* Fort Huachuca, AZ: U.S. Army Intelligence Center and Fort Huachuca, 2000. CD–ROM.

JP 2-01.3, *Joint Tactics, Techniques, and Procedures for Joint Intelligence Preparation of the Battlespace.* Joint Electronic Library, J-7, Joint Staff, 2002. CD-ROM.

Keegan, John. *The Face of Battle: A Study of Agincourt, Waterloo, and The Somme.* New York: Penguin Books, 1976.

Klein, Gary. *Sources of Power*. Cambridge, Massachusetts: The MIT Press, 1998.

Koch, Oscar. *G-2: Intelligence for Patton*. Philadelphia, PA: Whitmore Publishing Company, 1971.

Leonhard, Robert R. *The Principles of War for the Information Age.* Vovato, CA: Presidio Press, 2000.

Liller, Otto. "Evaluation of a Threat in the COE", *Infantry Online* 28. On-line database. Available at http://www.benning.army.mil/OLP/InfantryOnline/issue_28/art_150.htm. Accessed July 9, 2003.

Linden, Linda L. "To Predict or Not Predict: Crossroads for Tactical Intelligence?" SAMS Monograph, Fort Leavenworth, Kansas, 1989.

Makridakis, Spyros. *Forecasting, Planning, and Strategy for the 21st Century.* New York: Free Press, 1990.

_____ and M. Hibron. "Accuracy of Forecasting: An Empirical Investigation. *Journal of the Royal Statistical Society*, CXLII, Part 2, Series A, 1979.

Mann, Edward C., Gary Endersby, Thomas R. Searle, *Thinking Effects: Effects Based Methodology for Joint Operations, CADRE Paper No. 15,* Air University Press, Maxwell Air Force Base, Alabama. October 2002.

Marks, James A. "In Search of the Center of Gravity: Operational Intelligence Preparation of the Battlefield." SAMS Monograph, Fort Leavenworth, Kansas, 1990.

McMaster, H.R., "Crack In The Foundation: Defense Transformation and the Underlying Assumption of Dominant Knowledge in Future War," Student Issue Paper Vol. S03-03, Center for Strategic Leadership, U.S. Army War College, Nov. 2003. On-line database. Available at http://www.carlisle.army.mil/usacsl/Publications/S03-03.pdf Accessed 15 November 2003.

Meigs, Montgomery C., "Unorthodox Thoughts about Asymmetric Warfare," *Parameters,* Summer 03. On-line database. Available at www.carlisle.army.mil/usawc/parameters/03summer/meigs/pdf. Accessed July 9, 2003.

Milbank, Dana. "Bush Was Surprised At Lack of Iraqi Arms." *Washington Post*, 9 February 2004.

Mintzberg, Henry. *The Rise and Fall of Strategic Planning*. New York: The Free Press, 1994.

Naveh, Shiman. *In Pursuit of Military Excellence: The Evolution of Operational Theory*. London: Frank Cass Publishers, 1997.

Pariante, Joy. "Wallace Discusses OIF Intel at Huachuca," *Fort Leavenworth* (Kansas) *Lamp*, 5 February 2004.

Purcell, Thomas C. "Operational Level Intelligence: Intelligence Preparation of the Battlefield." Carlisle Barracks PA: Army War College, 1989.

Quirk, Richard J. III. "Seeking a Theory of Tactical Intelligence to Support the AirLand Battle." SAMS Monograph, Fort Leavenworth, Kansas, 1985.

Reynolds, Scott M. "Through a Clouded Prism: Forecasting Intra-State Conflicts at the Operational Level." SAMS Monograph, Fort Leavenworth, Kansas, 1996.

Rodriguez, Guillermo A. "Intelligence Preparation of the Battlefield: Is It Worth the Effort?" SAMS Monograph, Fort Leavenworth, Kansas, 1990 .

Schmitt, J. F., and Klein, Gary. "Fighting in the Fog: Dealing With Battlefield Uncertainty." Marine Corps Gazette 80. August 1996.

Strange, Joe. *Centers of Gravity & Critical Vulnerabilities: Building on the Clausewitzian Foundation So That We Can All Speak The Same Language*. Quantico, Virginia: Marine Corps War College, 2002.

Sun Tzu. *The Art of War*. Translated by Samuel B. Griffith. New York: Oxford University Press, 1971.

Thaden, Russell H. "Intelligence Preparation of the Battlefield and Predictive Intelligence." SAMS Monograph, Fort Leavenworth, Kansas, 1986.

Townsend, Elias Carter. *Risks: The Key To Combat Intelligence*. Harrisburg, Pennsylvania: The Telegraph Press, 1955.

van Creveld, Martin. *Command in War*. Cambridge: Harvard University Press, 1985.

von Bertalanffy, Ludwig. *General Systems Theory*. New York: George Braziller, 1993.

von Clausewitz, Carl. *On War*. Translated and edited by Sir Michael Howard and Peter Paret.. Princeton, NJ: Princeton University Press, 1976/84.